FAA AVIATION NEWS

DECEMBER 1967

COVER

An up-to-date source, such as the Airman's Information Manual, is essential for safe cross-country flight planning. It will also help you decode the message. See page 4.

FAA AVIATION NEWS

DEPARTMENT OF TRANSPORTATION / **FEDERAL AVIATION ADMINISTRATION** VOL. 6 NO. 8

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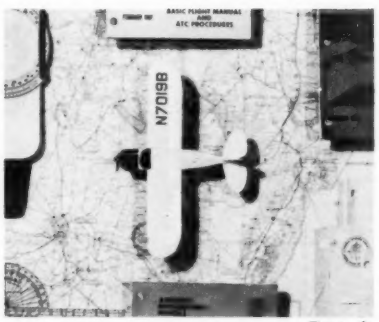

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DEPOSITORY

GO or NO GO

New Ruling on IFR Landing Procedures Gives More Leeway to Pilots

Greater utilization of non-hub airports in restricted weather conditions can be expected as a result of the Federal Aviation Administration's recent decision to abolish the cloud ceiling concept as one of the criteria for permitting instrument landing approaches.

For more than ten years instrument landings at all airports have been governed by specific minimum requirements for visibility (usually at least one-half mile) and for a cloud ceiling no lower than 200 feet above the ground.

The new ruling abolishes the ceiling criterion and substitutes a "Minimum Descent Altitude" (MDA), which refers to the lowest altitude an aircraft can descend to, in instrument weather, before the pilot determines whether he has sufficient visibility to see the runway. If the visibility is adequate, he may continue his landing regardless of the reported cloud ceiling at the airport.

The MDA is expected to be established as low as 350 feet for most airports where obstruction clearance is adequate, for pilots making a non-precision approach. Aircraft under radar guidance or making a precision straight-in ILS approach will be permitted to descend to a "Decision Height" as low as 200 feet, before deciding whether the runway environment is clearly in sight (100 feet for Category II equipped aircraft and qualified pilots, at approved airports—see FAA AVIATION NEWS for July, 1967).

Navigational aids such as DME, direction finding equipment and VORTAC, as well as radar, may be used to help the pilot line up with the runway. At the missed approach point, the pilot must make a go—no go decision.

Since the great majority of the nation's 10,000 airports do not have weather bureau personnel or equipment for measuring cloud ceilings, it has been necessary in the past for pilots to estimate ceilings for many airports on the basis of reports from hub airports. Sudden changes in weather conditions have forced the closing of airports abruptly, when the ceilings at nearby hubs fell below minimums—when in fact it may have been possible for aircraft already in the vicinity to make a safe instrument approach at the smaller airport.

Under the new ruling, IFR pilots will be able to decide with their own eyes whether or not the instrument landing may be safely followed through. They will also be able to take advantage of local breaks in the cloud cover to make an approach, instead of waiting for a ceiling to lift over a wide area.

No change at the present time has been made in the rule which provides for ceiling and visibility minimums for taking off at specific airports.

FAA's program for improved use of airports in instrument weather was outlined in the "U.S. Standard for Terminal Instrument Procedures (TERPS)" published in September, 1966. The guidelines laid down in this handbook have been adopted by all civil and U.S. military services including the Coast Guard.

The TERPS program will involve a review and reconsideration of all terminal instrument procedures over the next two years. It is part of FAA's overall plan for achieving increased utilization of airports, in view of the anticipated doubling of air traffic activity over the next decade.

IFR pilots should consult the latest instrument approach charts and NOTAMS for information on the current status of instrument procedures at the airports they will be using.

SUMMARY OF CURRENT TERMINAL PROCEDURES

VFR Takeoffs.....No change.....

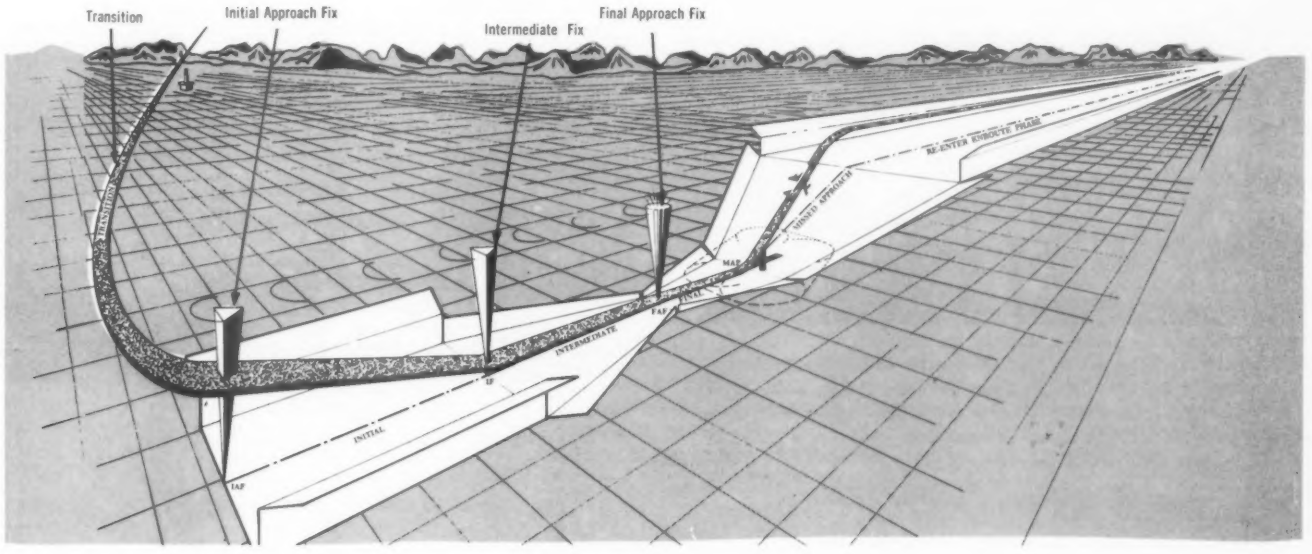
IFR Takeoffs.....No change.....

VFR Approaches.....No change.....

IFR Approaches, without precision instrumentation pilot may descend to the specified Minimum Descent Altitude, at least 350 feet, before deciding whether he can land with visual reference to runway.

ILS or PAR. Category I . . . pilot may descend to the specified Decision Height, usually 200 feet, before deciding whether he can land with visual reference to the runway.

ILS Approaches, Category II . . . qualified pilots, with properly equipped aircraft at approved airports may descend to a Decision Height of 100 feet before deciding whether a landing can be made with visual reference to the runway.



DEPOSITORY

AIM a BOOK CLUB for Pilots

What's in a name? Quite a bit, if you happen to be talking about AIM, the Airman's Information Manual, which sets its sights on the complete operational needs of the nation's airmen. Old timers who were plying the airways in the '30's may still recall AIM's forerunner—WENOA. It stood for the Civil Aeronautics Administration's *Weekly Notice to Airmen* and it made its first appearance as an eight page newsletter on June 27, 1933.

In March 1943 WENOA underwent a name change and became the *Airman's Guide*, with unrestricted distribution to civilian and military users. It appeared under this name for almost 20 years, being refined by the addition of new features and more detailed information. With Vol. No. 19 (Nov. 17, 1964) the Airmen's Guide ceased publication, with the notice that it would be superseded by the *Airman's Information Manual*, which had been under field test for a year. On Dec. 9, 1964, the first AIM appeared as a four-part publication. In May, 1966, it was changed to the present three-part format.

Part I is a well organized compendium of aviation and aviation-related facts, plus a liberal education of what goes into the make-up of the national airspace system. So that everyone starts off on the right foot, AIM opens with a four-page glossary of aeronautical terms pertaining to air traffic rules, regulations, procedures and facilities.

It is the kind of manual that a pilot can browse through repeatedly with profit. Its section on good operating practices is a common-sense review of safety in the air. There are sections on air navigation aids—not just their definition, but how they work and what they do; also on radar, aviation medicine, airports, air navigation lighting and marking aids, radio-telephone phraseology and techniques. The Morse code is shown alongside the International Civil Aviation Organization (ICAO) phonetic alphabet.

Widely used as a textbook in flight training, Part I is also a profitable refresher course for experienced pilots.

The section on air traffic control moves the pilot in logical steps through the FAA-recommended procedures from take-off to landing. Step-by-step the flyer is introduced to all the safety features built into the national airspace system—departure, enroute and arrival. A wrap-up section discusses international flight in and out of the country.

Part I also describes SCATANA (Security Control of Air Traffic and Air Navigation Aids). During emergency conditions affecting the defense of the U.S., landing, grounding, diversion, or dispersal of aircraft and control of air navigation aids come under military control. Air Defense Identification Zones (ADIZ), where interception by the Air Force is possible when pilots fail to follow prescribed procedures for these areas, are delineated.

Part 2, Airport Directory, lists some 7,500 airports including separate listings of seaplane bases and heliports in the U.S., Puerto Rico and the Virgin Islands which are available for transient civil aircraft use. A tight shorthand, consisting of terse abbreviations, acronyms, numerals and symbols, conveys a wealth of airport information with remarkable brevity. Data on airport communications and navaids appears in Part 3.

In addition to location, elevation, number and surface of runways, runway lights and bearing capacity, Part 2 tells what lighting is available, and what fuel and servicing are offered at a particular airport. In the case of seaplane bases, the quantity

Current volumes of FAA's AIM are available for reference in all flight service stations.

AIM on the planning table means vital information at hand and a relaxed pilot in the cockpit.

and type of beaching gear available and the number of mooring bouys and crash boats are given.

Part 3, *Operational Data,* and Part 3A, *Notices to Airmen* are bound together, although Part 3 is replaced every 28 days and Part 3A, which contains the very latest in Notices to Airmen, every 14 days.

Part 3 opens with a master alphabetical index of all parts of the *Airmen's Information Manual.* This is a great time-saver when information is needed in an emergency. There is also an airport and facility directory listing all major airports with communications, assigned frequencies of all air navigational aids, parachute jumping areas, preferred routes, standard instrument departures and substitute routes.

A special feature of Part 3, developed for pilots flying with visual (i.e., sectional) charts, is the Sectional Chart Bulletin. The bulletin reports major changes in aeronautical information that have occurred since the last publication date of each U.S. Sectional Aeronautical Chart, thereby providing the VFR pilot with data needed to keep his charts current.

Oil Burner Missions are low-level navigation or bombing training flights found in almost every region of the U.S., carried out all year round in both VFR and IFR weather. Close attention to the section on Oil Burner Routes in Part 3 and pertinent NOTAMS provide minimal protection for flying in these areas. The missions are divided into two categories—"Short Look" and "Laydown," conducted from 4,000 to 6,000 feet MSL; and "Long Look", generally flown between 18,000 and 21,000 feet MSL.

Scheduled weather broadcasts carry information about the current operational status of a particular Oil Burner Route. This information can and should be obtained from all flight service stations.

AIM data is further updated for the pilot hourly through the national Notice to Airmen system. These NOTAMS are a day-to-day journal of changes affecting safety in flight. These include changes in the status of airports, air navigation aids, instrument approach procedures and emergency revision of Oil Burner routes—anything that might impair safe operation. When these changes are printed in AIM, *underlining or black dots* indicate new or revised information; *checkmarks* identify items that will usually be cited only once. This data should be transcribed onto charts and records, pending routine inclusion as new charts are published.

For example, underlined and checked is the item: *"FORT COLLINS, COMMUNITY AIRPARK ASSOCIATION ARPT:* change 'arpt' name to "Valley Airpark". Nothing spectacular, but changing the name on the chart could avoid panic in a "lost aircraft" situation.

Each morning at 4:35 (Washington time), 15 local summaries of current data (called NOSUMS) go out to the field from FAA headquarters in Washington, D.C. These contain the latest word on the status of navigation aids, runway conditions, state of repairs on and around airports, changes in instrument procedures, special restrictions and cancellation of NOTAMS when conditions change. NOTAMS are transmitted 24 hours a day, seven days a week over available weather circuits, and revised as often as necessary. They go to some 3,500 recipients —all major FAA installations, control towers, flight service stations, etc. plus anyone else desiring to subscribe to the service.

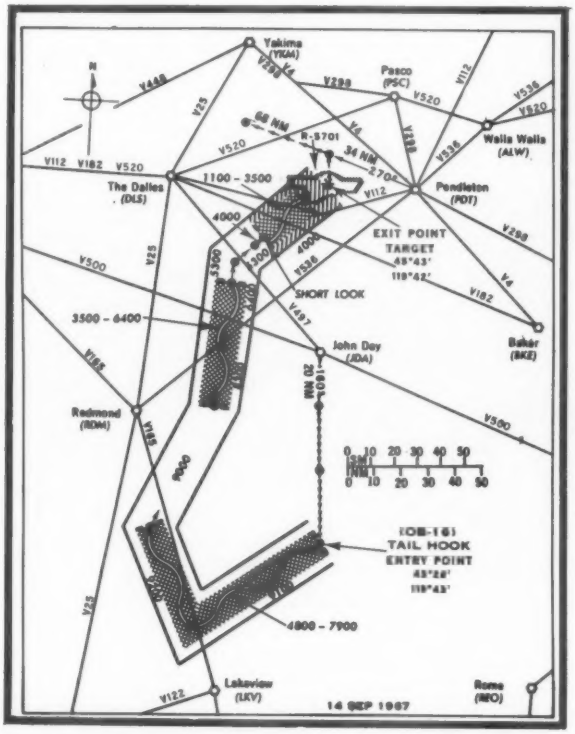
AIM has shown a steady circulation growth since its inception. In January, 1965, the first month after it was introduced, 19,881 AIM's were sold. By August, 1967, the number of civilian subscribers had climbed to some 30,000. FAA Air Traffic Service experts say that the subscription number is only the tip of the iceberg—they put the readership beyond the 100,000 mark.

AIM may be purchased by the individual part, if so desired. Each of three parts has a different publication date, selected to provide maximum service to users. Part 1, *Basic Flight Manual and ATC Procedures,* is published quarterly, and costs $2 a year, with a 50-cent postage charge for foreign subscribers. Part 2, *Airport Directory,* is issued semi-annually. It costs $2 a year, with a 50-cent foreign mailing charge.

Part 3, *Operational Data* (13 issues) and Part 3A (26 issues) have a combined price of $9, plus a foreign mailing charge of $2.25.

Annual subscriptions to the complete AIM package for the contiguous U.S. is $13, with an additional $3.25 in mailing charges for foreign addresses. Two companion publications, the *Pacific Airman's Guide and Chart Supplement* and the *Alaska Airman's Guide and Chart Supplement* are available for $12.00 each. Published once a month, they are airmailed to Alaskan and Pacific subscribers.

—Frank J. Clifford



Left—AIM has accurate, timely data and charts of "Oil Burner" routes. Above, left—Technician in Washington FAA headquarters readies high-speed reperforator to receive hourly weather and NOTAM reports. Machine can translate NOTAM code into 857 words a minute. Above, right—U.S. Coast and Geodetic Survey cartographer, using FAA-supplied data, updates an IFR enroute chart.

Bob Hoover

Confidence in the Cockpit

The difference between stunt flying and precision aerobatics may not be readily apparent to the hundreds of thousands of air show enthusiasts who have seen Bob Hoover's versions of the Tennessee Waltz in his P-51, but it can be defined as a matter of intent. Hoover's intention is to show, not how remarkable a flyer he is, but how remarkably responsive—and safe—an airplane can be when it is flown by a man who has mastered the craft.

Hoover "fell into" his career as a masterful demonstrator of airplanes in the African Desert in World War II, as a pilot with the U.S. Army Air Corps. In between flying 59 combat missions it became his job to wring out new aircraft being delivered to the front.

Fledgling pilots, Hoover discovered, were often quick to believe rumors of inherent faults in new aircraft types—some were said to be non-recoverable from a spin, others required excess runway for landing, etc. To dispell these gloomy myths and restore confidence in the airplane, Hoover would demonstrate spin recovery under every imaginable circumstance; or he would put the aircraft on the ground and roll to a stop far short of the anticipated distance. He used no special tricks—only the recommended procedures, executed with snap and precision. His claim—if I can do it, any good pilot can—put the doubting pilots to shame and sent them out to practice.

After the war, Hoover test flew military aircraft at Wright-Patterson Field in Ohio. He transitioned to jets and soon found himself once again involved in soothing the fears of pilots unaccustomed to handling the new fighter aircraft. The F-100, he recalls, had a reputation at Wright-Patterson of being difficult to land. Brakes were being overworked, tires blown out, tempers exhausted and the level of confidence in the aircraft had sunk to a dangerous low.

Hoover put an end to this myth by demonstrating speed control in an F-100 with a brand new set of tires; he flew the length of a runway just high enough off the ground to spin one wheel. He made the unbelieving F-100 pilots examine the tire at the end of his run, so that they might see for themselves that it bore no traces of wear—proving that the aircraft could be greased onto the runway with perfect control. After that, anyone who blew out a new set of tires on landing the F-100 had to admit that the pilot, not the manufacturer, was at fault. Tire life on the F-100 was soon lengthened appreciably, and confidence in the jet fighter restored.

Hoover joined North American Aviation Corporation in 1954, as a field service representative. He is now assistant to the Vice President of the Aircraft Group, but on weekends he continues to inspire pilots to fully master the aircraft they fly.

Relying mainly on North American's famous World War II fighter, the P-51 *Mustang*, he has demonstrated precision flying at hundreds of airshows, at home and abroad. In 1966 he was team captain for the U.S. Aerobatic Team during the International Competitions in Moscow.

The P-51 is a 450 mph piston-driven, four-bladed fighter, with a 3,475 feet-per-minute climb rate. It is extremely "clean" aerodynamically, and beautifully responsive to the controls. Despite the 8,505 lbs. of gross weight, its normal landing speed is 87 mph. Older pilots recall this original *Mustang* as the fastest U.S. built pre-jet fighter plane.

Hoover has been using the same P-51 for the past six years, and can recall only one cancelled demonstration due to mechanical failure (a broken camshaft). He logs about 200 flying hours a year in the *Mustang*, which is maintained in the normal "book" manner.

The versatile Hoover also demonstrates business jets at air shows, and he is chief evaluator for North American's OV-10A, a 265 knot turboprop VSTOL designed for counter-insurgency work. His affection for the P-51 remains strong, however, because of the broad appeal the *Mustang* has for the public, and the heart-warming response he has had from the aviation-minded youth of America who have been inspired by his flight demonstrations to build their own career in flying.

In Hoover's view, aerobatic maneuvers enhance flying skill because they demand—and demonstrate—perfect control of the aircraft; the sloppy pilot simply is out of his depth here. Also, precision flying means getting the best possible performance out of the aircraft under all conditions—which makes the precision flyer the safest type of pilot.

Although Bob Hoover is virtually unique among aerobatic flyers (he is one of the few men known to do 16 and 32 point rolls) he does not ascribe his success to any particular physical excellence. He wears glasses to fly, and he makes no claim for unusually quick reflexes or birdlike instincts. The *desire* to fly, he believes, is the keystone to his career.

He believes that no one who feels this desire strongly will settle for less than the best possible performance from the plane he flies.

—David Gelfan

Waltzing along the runway demonstrates the fine control possible at landing speed.

HOMEBUILT AIRCRAFT

What it takes to put Safe wings on a dream

Above—The homebuilt Deweybird, with its creator at the controls, swoops over Santa Paula, Cal. After a successful maiden flight the diminutive Deweybird is wheeled into the hangar.

From drawing board to finished product Jim Dewey's homebuilt aircraft required 5,000 hours

With the steadily rising interest in homebuilt aircraft all over the country, there is need for a word of caution to the creative pilot who can hardly wait to leap into the cockpit of his own handiwork: is it legal? Also—are you properly prepared to fly it? Legal and theoretical preliminaries to that all-important first flight are not clear to many pilots.

A good authority on the subject is A. J. "Jim" Dewey, former FAA Supervising Inspector of the Van Nuys (Calif.) General Aviation District Office (now retired). Jim Dewey is one of the nation's most avid and experienced devotees of the "do-it-yourself" airplane building vocation.

Dewey spent almost all his spare time for six years—some 5,000 hours—building his own high-performance plane which he calls "The Deweybird," now flying regularly. From the vantage point of his experience with that "first flight" and his background of more than 30 years with FAA, Dewey views any homebuilt machine with a mixture of concern and respect.

"You can't approach the first flight of any new airplane—particularly a homebuilt—casually," he emphasizes. "It takes time, planning and practice to put together a good flight test program."

FAA regulations require that a manufacturing inspector from an Aircraft Engineering District Office look at your new "bird" and fill out a Certificate of Airworthiness. At this time, the inspector will dictate limitations to insure safety. Usually these will include the restriction that initial flights must be made at outlying airports, away from densely populated sections.

It is generally considered that 75 hours of flight time are required to prove-out an aircraft without a certificated power plant, and 50 hours for one with a production aircraft engine, although this is not yet spelled out in the regulations.

In addition to the "Experimental" sign and placard advising all concerned that this is a home-built aircraft, there are three pieces of paper required before anyone can legally fly a home-built.

The first is an "Operations Limitations" document. For Dewey's home-built, the "Operations Limitations" sheet states: "This two-place, single-engine airplane has been certificated in the experimental category as a home-built aircraft for the purpose of personal transportation and recreation. This airplane shall not be used for any commercial activity. Occupancy restricted to personnel essential for flight. All flights shall be conducted to avoid areas of heavy air traffic or areas where flight would create hazardous exposure to people or property on the ground. Any major change in aircraft will invalidate the Airworthiness Certificate."

The second document required is an FAA Certificate of Registration. This certificate displays the "N" number which you may obtain on request from the FAA Aircraft Records Branch at Oklahoma City.

The third vital document is the Airworthiness Certificate. This must be renewed each year for home-builts although it applies indefinitely on regular production aircraft.

"After you've spent many years and dollars as a home-builder to complete a glistening new aircraft, you're not automatically qualified to fly the plane," Dewey cautions. "The best investment you can make it to take adequate dual from a current instructor at your local airport. And don't go to a buddy who flew in World War II or flies jets for an airline. Get a pilot who instructs in general aviation aircraft day-in and day-out for a living."

"Spend a great deal of time in the cockpit getting accustomed to how it feels and handles," Dewey advises. "Most homebuilts are 'tail-draggers' and may have a degree of restricted frontal visibility. Taxi tests, increasing in speed as you become more at home in your new plane, lessen the percentage of 'loss of directional control' incidents and accidents on your first landings."

The flight test program should be planned to "back into" any unknown areas of stability and control. This includes slow flight with stalls, engine-cooling climb tests and the like.

At Santa Paula (California) Airport, Dewey is living the life he likes best, working the few remaining "bugs" out of his home-built, "hangar flying" and visiting with his scores of friends in FAA and the aviation indusrty.

His friends are sure that as soon as there's no more challenge with the "Deweybird", Jim Dewey will be back building or rebuilding another aircraft.

—Clifford Cernick

Handle with care

The rapidly changing environment of the aircraft mechanic calls for alertness in the prevention of accidents on the ground

Above—a potentially dangerous situation. Mechanics work make certain no one enters the cockpit or handles controls An accidentally flipped switch could spin the prop.

Aviation safety usually means safety in the air, but ground safety is also an important consideration to the aircraft industry. In spite of the precautions that are now in effect, every year aircraft maintenance claims a serious toll of accident victims, both fatal and non-fatal. Although there is no standardized compilation of data in this field, the most recent survey by the Flight Safety Foundation, Inc. shows that more than 400 serious accidents occur each year as a result of handling aircraft on the ground.

General Aviation	Fatal	Non-Fatal	No. of Aircraft (Approximate)
1964	6	419	90,000
1965	5	416	98,000
Air Carrier			
1964	0	6	2,200
1965	0	8	2,300

While safeguards can be engineered into mechanical devices, and management can attempt to minimize hazards by prescribing sound work procedures, the final responsibility for safety falls on the man who is the potential victim—the aircraft maintenance man. Not only newcomers to this field but also many seasoned mechanics are not fully aware of the growing sources of injury inherent in aircraft maintenance.

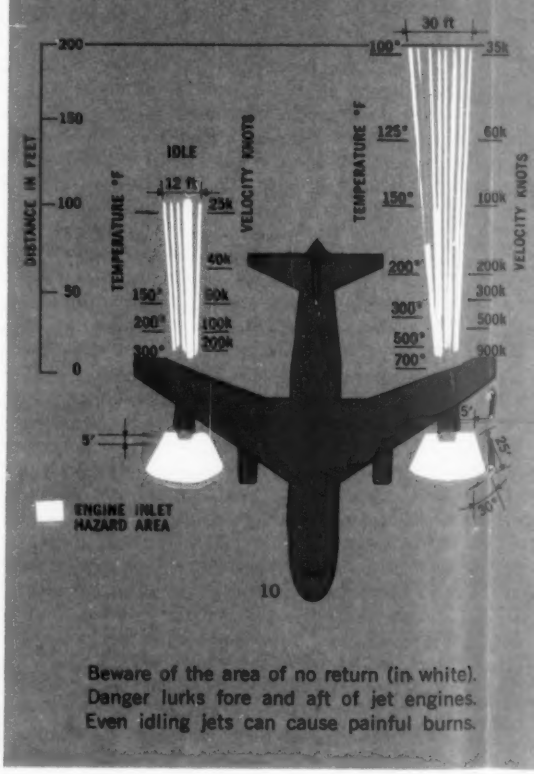
Some hazards are as old as simple hand tools: indeed, every tool ever invented can double as a weapon. The constant refinement and sophistication of machinery, while certainly contributing to efficiency of labor, have also increased the number of ways a man can get hurt. Today's maintenance man who wishes to remain healthy has good reason to be alert at all times.

Hazards traditionally associated with aircraft can be summarized as follows: (1) propellers, including helicopter blades; (2) explosive and highly inflammable fuels; (3) corrosive and toxic chemicals; (4) miscellaneous accidents resulting in falls or crushing, such as injury from unintentional movement of hinged or hydraulically controlled gear, etc. To these there is now a fifth and highly prevalent danger—jet engines which can blast or pluck an unsuspecting man off of his feet without visible warning, or which can cause permanent damage to hearing.

Propeller accidents, the familiar nightmare of early days in aviation, still claim a steady toll. In 1966 at least six persons are known to have been killed by whirling blades; ten were injured severely. Most of the casualties were not stray bystanders or apprentice help, but experienced aircraft mechanics. It appears that familiarity sometimes breeds a fatal contempt, in place of a healthy respect. Another interpretation is that the mechanic who is in the habit of walking safely around the props of a twin-engine airplane may have difficulty in changing his pattern when moving over to four-engine aircraft, and run afoul of the outboard engines. Similarly, if he has been used to working on multi-engine aircraft, he may be in the habit of leaning carelessly against the nose cone—which in the case of single-engine aircraft turns out to be the propeller spinner.

Foolproof guards against moving propellers are virtually impossible to devise. There are conditions of light and sound wherein an engine operating wide open can be mistaken for an inactive one, usually a very fatal mistake. The only safe rule for the aviation mechanic to rely on is to mentally mark off in red the area forward of the wing of all aircraft, and to approach this area with the caution of a man who knows he is treading on dangerous ground. *Pulling chocks calls for extreme caution in all types of aircraft.*

In the case of jet engines, of course, the area aft of the engines is also a potentially dangerous one. At a distance of *100 feet* to the rear of a four-engine jet, for example, the wind velocity from one engine on full



Beware of the area of no return (in white). Danger lurks fore and aft of jet engines. Even idling jets can cause painful burns.

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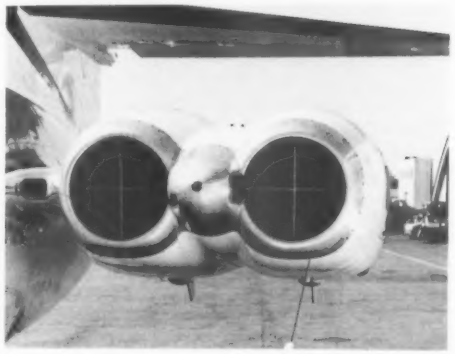


Top—the business end of a business jet can be just as dangerous as an airline engine. Bottom—beware the prop, and don't forget the ear muffs when working around turbo-prop engines.

power can be well over *100 mph*, easily enough to knock over a man. Even if the engine is only idling, the wind velocity at that range can be up to 30 mph. The hazard area *forward* of a jet engine being run up is a cone-shaped area expanding to 30 degrees to either side of center, to a distance of 25 feet from the air scoop. This is sometimes called, grimly enough, the "area of no return."

Jet exhaust is also capable of inflicting painful burn injuries to the unprotected worker. The exhaust gases leaving a revved up jet engine may be as hot as 700° F. At a distance of 75 feet aft of the engine the temperature of the exhaust blast is about 200° F. over a pathway ten feet across. The idling jet engine affects a smaller area with high temperature exhausts.

Therefore the careful mechanic must regard all of the area—forward and aft—inboard from the wing tips of a jet aircraft as a hazardous area at all times. On a noisy, windy ramp it is sometimes impossible to tell by looking whether jet engines are shut down or in operation. Safety lies in assuming that any jet engine that is not capped may be operating.

Loss of hearing is a more subtle type of "accident" around jet engines, since the damage is usually done gradually rather than all at once. It is quite possible to rupture an unprotected ear drum by exposure to jet engine noise, but usually the hearing loss takes place slowly as a result of deterioration of the inner ear structure, following repeated exposures above the tolerance level.

The U.S. Air Force requires the wearing of protective earmuffs in the vicinity of any aircraft where the sound pressure measures 95 decibels or above. Practically speaking, of course, mechanics do not carry sound meters around with them. But any sound which is intense to the point of discomfort may be assumed to be harmful.

The sound pressures in the close vicinity of jet engines revved up on the ground range between 120 and 140 decibels—a decidedly painful noise. Even a very brief exposure in this range will damage most peoples' ears. The damage is cumulative and, in many cases, the progressive loss of hearing cannot be reversed by medical treatment.

The size of the engine is no measure of its dangerous potential—the inlet and exhaust velocities are approximately the same in all jet engines.

The notion that a man can "get used to" severe sound vibrations of this order is entirely fanciful. The only accommodation made is loss of hearing. Other harmful effects from loud engine noises are increased blood pressure, muscular contractions and excessive fatigue. An added danger is the possibility that the noise could block out shouts from fellow employees warning of sudden impending danger, such as uncontrolled aircraft movements, toppling platforms, or fire.

The best protection against engine noise is to wear approved muffs, helmets or ear plugs. These effectively screen out the destructive force of jet noises without interfering with normal conversation.

Some of the major airlines make it a practice to give every maintenance man an audiogram (an electronic charting of his hearing responses) before he begins work. With this baseline data in his medical record, it is a simple matter to make periodic checks to determine whether any abnormal loss of hearing has taken place. All mechanics who work around live engines are advised to avail themselves of this protection, either through the company's medical facilities or through consultation with their own physician. The expense is minimal and the damage, remember, may be irreparable.

Dust and debris are often hurtled through the air with abrasive force during engine run-ups. A good pair of safety glasses will protect a mechanic's most valuable tool—his eyes.

Good safety habits do not come naturally, especially in an environment which has been changing as rapidly as the aviation industry. Compared with the aviation mechanic, the automobile mechanic has seen few really significant (from the point of view of maintenance safety) changes in his environment. The major airlines have recognized the need for safety education as a continuing shop program with the introduction of classroom lectures and the frequent publication of alert bulletins and safety posters. Trans World Airlines' publication, "Safety on the Job," is an excellent example of an effective safety booklet, and is applicable to most aircraft maintenance men. ■

(Part II of this article will deal with safe maintenance practices in the handling of fuel, chemicals and pressurized equipment.)

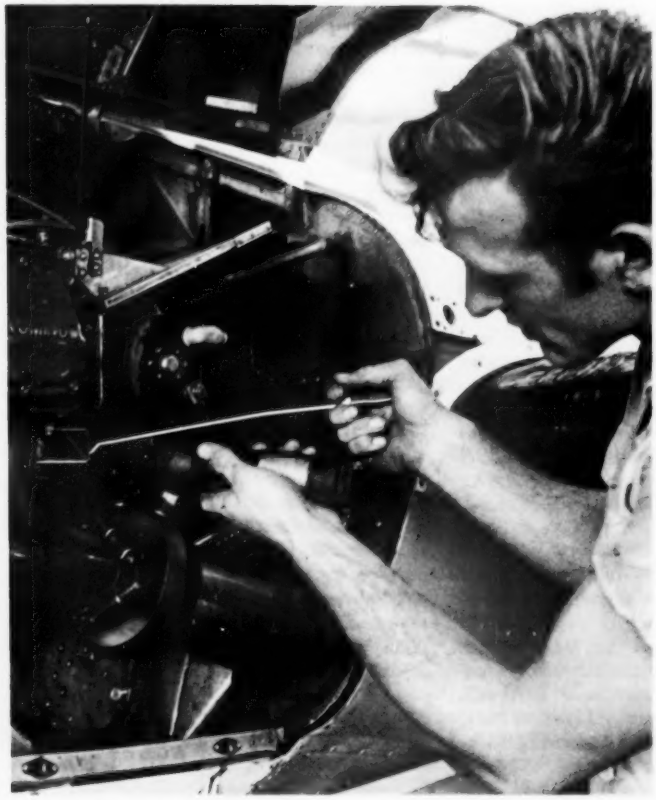
MECHANICS SAFETY AWARDS

Deadline for entries in the fifth annual FAA Aviation Mechanic Safety Award Competition is December 31. Aviation mechanics all over the world are eligible to compete for 70 awards, including two top cash prizes of $500. The competition is co-sponsored by the Air Transportation Association of America, American Aviation Publications and the National Aviation Trades Association. Entry forms are available at all FAA field facilities. The three categories of eligibility are: (1) improvements to airframes or engines, (2) improved maintenance or inspection procedures, and (3) superior professional performance.

What's Up Front A new series on aircraft engine components, how they work and how to prevent their failure—

Engine Exhaust Systems

Part II ● Preventive Care



Mechanic uses a flashlight and a variable angle mirror to get a behind the scenes view of engine exhaust stack. Cracked or deteriorated gaskets are a frequent cause of lost engine power and fire.

Exhaust systems in general aviation aircraft fall into two styles, the horizontal cross-over type and the separate system type.

In the horizontal cross-over type, the exhaust stacks from both banks of exhaust ports feed a single cross-over muffler which forms an integral part of the system. The muffler is usually supported horizontally by the stacks and is located immediately behind the engine.

As the name implies, the separate system has a muffler and tailpipe for each bank of cylinders, with the mufflers supported either vertically or at a downward angle.

FAA investigators at NAFEC divided the basic systems into two classes and analyzed the failure characteristics of each. The frequency of failures in the horizontal cross-over system was generally high during the first 800 hours, after which it fell off gradually.

In the separate system, the frequency of failures reached a maximum between 150 and 200 hours, and thereafter declined sharply. Examination of the failures showed that a higher percentage of *internal* muffler failures occurred in the crossover type exhaust system. When this kind of failure was discounted, the failure frequency rate of the cross-over system was similar to that of the separate system.

Exhaust system failure, in general, is attributed by the NAFEC investigators to inadequate testing. While aircraft engines are rigorously tested prior to certification, no such requirement exists for exhaust systems. Exhaust systems fail more frequently in new models of aircraft while design and fabrication bugs are being worked out. As a model "matures", design changes result in longer exhaust system life.

Currently, exhaust systems in general aviation aircraft are made of stainless steel type AISI-321 or AISI-347. AISI-321 includes 18 per cent chromium, 8 per cent nickel, .08 per cent carbon, 2.5 per cent maganese and .5 per cent titanium (approximately).

AISI-347 contains the same ingredients but has 9 per cent (instead of 8) nickel and columbium is substituted for titanium.

Promising results are being shown by two new alloys—type 310, which contains 25 per cent chromium and 20 per cent nickel, and Incoloy, which has 21 per cent chromium and 34 per cent nickel.

One drawback to the use of the newer alloys is cost. AISI-321 and AISI-347 costs about 50 cents a pound, while the newer metals run to about twice that. With most general aviation exhaust systems weighing between 10 and 17 pounds (a few weigh less than 10), the increased cost is not a serious handicap.

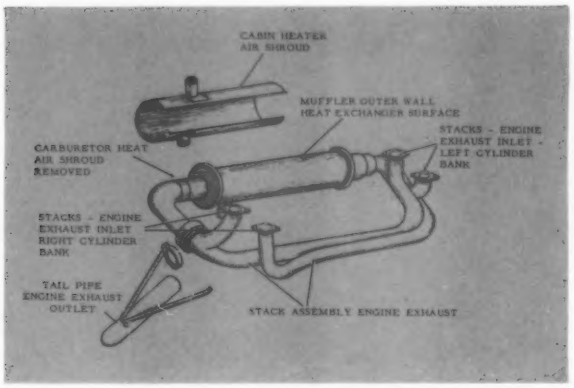
Testing the System

In most designs, inspection of the exhaust system requires removal of the engine cowling but the expenditure of time is a sound investment in safety. The push and pull method of examination—grasping the exhaust manifold where it connects with engine ports, where it enters the muffler and at mounting points—is the best procedure. A flashlight, and a stiff wire brush, are valuable tools in examining welds. Make sure all nuts and other fastenings are secure and all safeties intact.

Rigorous inspection of the exhaust manifold and heater muff should not be left until the annual inspection but should be carried out at regular intervals in between. Because of the high temperatures and vibration to which the exhaust system is subjected, cracks and holes in the system, and in its mounting at engine ports and support brackets, can occur at any time. Whenever the opportunity presents itself, *inspect*—even if the annual inspection took place only a few hours ago.

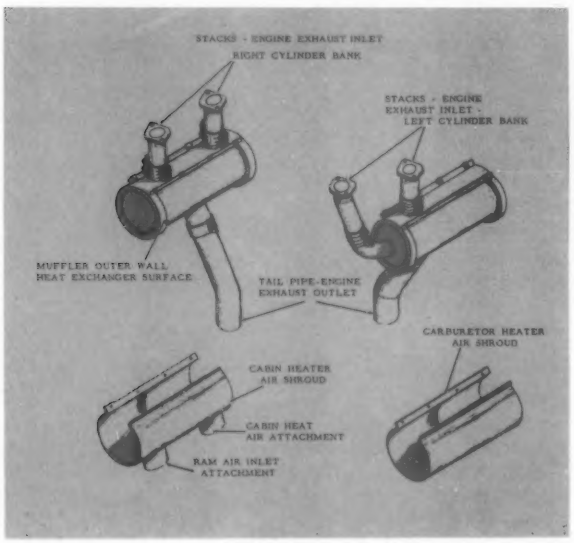
Special attention should be paid to exhaust stack slip joints, cracks or holes anywhere along the system, openings in the firewall, defective gaskets all along the system from the engine ports to tailpipe, and inadequate sealing of fairings around strut fittings on the fuselage or cabin.

A constant alert should be maintained for carbon monoxide (CO) poisoning. While CO, the killer gas, is odorless, colorless and tasteless, the vehicle it travels in—"exhaust fumes"—is not.


CABIN HEATER AIR SHROUD
MUFFLER OUTER WALL HEAT EXCHANGER SURFACE
STACKS - ENGINE EXHAUST INLET - LEFT CYLINDER BANK
CARBURETOR HEAT AIR SHROUD REMOVED
STACKS - ENGINE EXHAUST INLET RIGHT CYLINDER BANK
TAIL PIPE ENGINE EXHAUST OUTLET
STACK ASSEMBLY ENGINE EXHAUST

Top—Cross-over exhaust system.

Bottom—Separate exhaust system.


STACKS - ENGINE EXHAUST INLET RIGHT CYLINDER BANK
STACKS - ENGINE EXHAUST INLET - LEFT CYLINDER BANK
MUFFLER OUTER WALL HEAT EXCHANGER SURFACE
TAIL PIPE-ENGINE EXHAUST OUTLET
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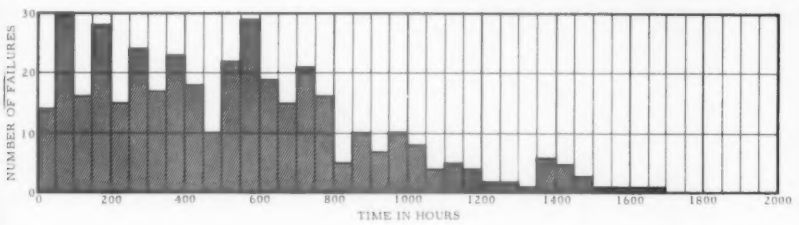
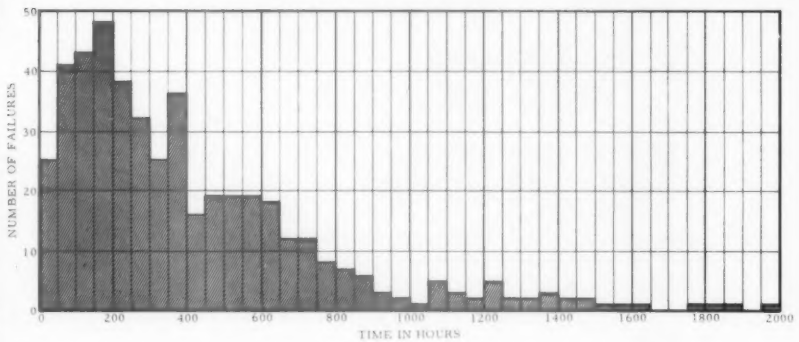
CABIN HEATER AIR SHROUD
CABIN HEAT AIR ATTACHMENT
RAM AIR INLET ATTACHMENT





Top—Table shows high frequency of failure of the horizontal cross-over type of exhaust system occurred during the first 800 hours, after which time it fell off markedly. Bottom—In the separate type exhaust system, the frequency of failure began to decline after 150 to 200 hours.

The odor of exhaust in the cabin is sufficient warning to take immediate action.

A *colormetric* test apparatus, developed by the National Bureau of Standards, is an effective method of determining the presence of CO. A simpler sampler, which gives a cumulative reading, is available for about $1. This detector is a 1/16 inch thick square of plastic about as big as a playing card. A chemically treated, dime-sized "spot" retains the same tan color of the surrounding plastic when there is no CO present.

CO will darken the spot (however, so will a heavy concentration of tobacco smoke). NAFEC engineers have developed a color code to use with the plastic detector which relates the shade of the "spot" with the concentration of CO. The darker the spot, the greater the concentration of CO.

Ideally, two plastic CO detectors should be used—one exposed in the cabin, the other sealed in its cellophane wrapper. When the exposed one shows signs of darkening, the other would be unwrapped to determine if a dangerous concentration of gas is present, or whether the darkening was the accumulation of other contaminants.

CO poisoning is very real indeed. In a nine-month random test involving 200 aircraft, 19 per cent had measurable levels of CO contamination.

Progress is being made in exhaust system development, but it is mostly cut-and-try. For example, an aircraft model introduced in 1959 had exhaust system failures after an average operating time of 236 hours. From 1959 through 1961, six design changes were made in the exhaust system and average operating time before failure was increased to 521 hours.

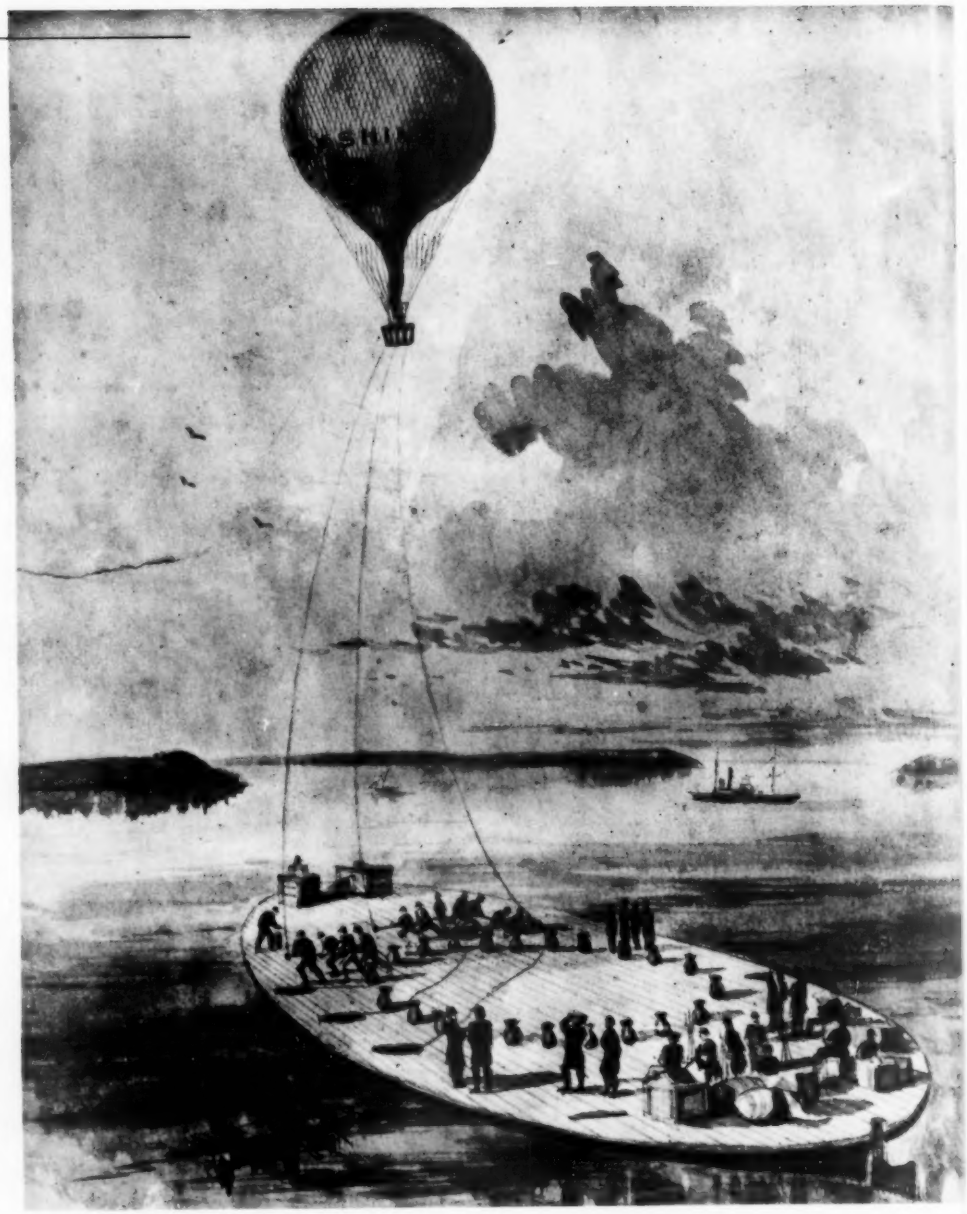
Two FAA studies seek to eliminate this chancy way of doing business by establishing solid engineering and metallurgical guidelines. ■

Full reports of the FAA exhaust system studies can be obtained for $3 each from the Clearing House for Federal and Scientific Information, Springfield, Va., 22150. Ask for AD-614-913 "Metalurgical Evaluation of Failed Aircraft Stainless Steel Exhaust System Components" and AD-612-949 "Analysis of Engine Exhaust System Failures in General Aviation Aircraft."

famous

FLIGHTS

THE FIRST WAR IN THE CLOUDS



Aviation, like so many industries, won its spurs on a military field. In the United States, the Civil War set the stage on which American aeronauts first gained national fame. The Union Army's balloon corps was so successful that the war might well have been brought to an earlier conclusion if dissension and jealousy had not deflated the corps prematurely.

In 1860 the Union Army was fortunate in obtaining the services of the foremost American balloonists of the day. Perhaps the most daring of them all was John La Mountain, the only man bold enough to make free reconnaissance flights over enemy territory. La Mountain repeatedly drifted his balloon over the Confederate lines, made observations, and then ascended high enough for opposing winds to carry him back to his own lines.

But the man credited with making a science of observation ballooning was "Professor" Thaddeus Lowe, of Cincinnati, famous as the designer of the *City of New York*, largest balloon the world had ever seen (in 1859), with a lift of *22½ tons*. For military observation, Lowe designed captive balloons of a much smaller size, equipped with telegraphic cables that enabled him to communicate his observations directly to the field commander, and in one instance to President Lincoln himself.

So impressed with Lowe was Washington that 50 seamstresses were put to work sewing balloon fabric according to his design.

By the end of 1861 Lowe had a flotilla of seven balloons under his direction. All were brilliantly decorated and varied in size from the 32,000 cubic feet *Intrepid* to the 15,000 cubic feet *Eagle* and *Excelsior*. Each was equipped with enough manila cable to raise the balloon 5,000 ft. Ground crews using lignum vitae hardwood snatch blocks (winches were too slow) raised or lowered the balloons as rapidly as possible, to minimize their vulnerability to enemy fire.

Each balloon was furnished with five miles of insulated telegraph cable and alternative color-coded signals. Lowe also provided each unit of his new air arm with portable hydrogen generators, using the 'wet' sulphuric acid/iron process. Mounted on four-wheeled horsedrawn carriages, Lowe's generators were heavy but a vast improvement on anything used before. They could inflate a balloon in 2½ hours on an average consumption of 1,600 lbs. of acid and 3,300 lbs. of iron filings. Cost of inflation averaged from five to six dollars a day; one inflation could last a fortnight.

A coal barge rebuilt with a special launching deck as a mobile balloon base, the *G. W. Parke Custis*, was the first vessel to be specially designed as an aircraft carrier. The *Custis*, entered service on the Potomac in November 1861. On one occasion she towed one of Lowe's balloons for 13 miles at 1,000 ft. while the aeronaut made continuous observations. At the battles of Four Oaks and Gaines's Mill, Lowe's aerial observations twice saved the Union forces from defeat. They also hampered the enemy by enforcing concealment, including the

Left—"Professor" Lowe, tethered to the Custis, America's first aircraft carrier, reports enemy activity south of Mt. Vernon, 1861. Below—Lowe ascends for an artillery fire direction mission near Vienna, Va. He had a telegraphic link to the ground.

blackout of camps after dark. Lowe also initiated the first direction of artillery fire from the air.

By 1863 the Union balloon corps had begun to have a demoralizing effect on Confederate troops. But by some inexplicable twist of fortune, responsibility for the corps was taken out of Lowe's hands and given to a military engineer with neither interest in nor knowledge of ballooning. The corps rapidly disintegrated.

The Confederate Army, while suffering from the absence of capable balloonists, nevertheless made a few gallant attempts at retaliation. A young Army captain, John Randolph Bryan, made several ascents in a captive hot air balloon, but was greeted with such withering Union fire that he barely escaped with his life. In order to reduce his time of descent, a system was devised whereby six artillery horses driven at full gallop hauled down the cable. When the Union forces gave up ballooning in 1863, the Confederates were happy to follow suit.

The use of the balloon for military observation made the deficiencies of its traditional shape apparent. For free flight its spherical or pear shape was perfect, but it provided far too much wind resistance when held captive. Experiments with sausage and cigar shapes followed.

Over the ensuing 100 years, lighter-than-air vessels have, unfortunately, made their mark primarily in war, although there has been a continuous, lesser known usage by scientists seeking meteorlogical and atmospheric data. Hopefully, as a military weapon, they will soon take their place in the Museum of Wars.

—Harriet Weber

BRIEFS

• TEXAS IS STILL NUMBER ONE when it comes to the number of landing facilities within a state's borders— it has 881. Others in the top five are: California, 669; Alaska, 607; Illinois, 446; Pennsylvania, 443. As of August 1, there were 10,015 landing facilities in the 50 U. S. states, including 9,209 airports, 419 heliports and 307 seaplane bases. This is an increase of 533 since the end of 1966, despite the 191 airports abandoned since the first of the year. The FAA tally excludes military airfields but includes those which serve both military and civil traffic. For general public there are 6,846 landing facilities; the remaining 3,169 are for private or emergency use.

• TURBINE POWERED AIRCRAFT, both large and small, now come under the same noise abatement rules pertaining to minimum altitude, climb and preferential runway. A new FAA ruling requires small turbine planes as well as bigger aircraft to maintain flight at or above the glide slope when landing on an instrument landing systems runway. In addition, the new rule requires pilots of all turbine-powered aircraft, when operating within an airport control tower to: (1) maintain 1,500 feet above the airport surface until further descent is necessary to make a safe landing; (2) climb to an altitude of 1,500 feet above terrain as rapidly as possible, unless otherwise required by departure procedures or applicable distance from clouds criteria, and; (3) use the preferential runway assigned by Air Traffic Control at airports where the FAA has established such a system. The above provisions applied previously only to large aircraft.

• BAKED AIRCRAFT TIRE is a specialty of the house at Goodyear Tire & Rubber Co., where an oven simulates temperatures expected to be encountered in the wheel well of a Supersonic Transport. While the SST will have a gross weight of 675,000 pounds, the load will be distributed among 16 tires in the landing gear. However, runway contact speed is expected to be in the area of 135 knots, sufficient reason for meticulous research and development to make sure the huge craft is fitted with the right kind of "shoes."

• WE STARTED TO BRING IN 648 NEW CONTROLLERS last spring, and we have asked Congress for 800 more, FAA Administrator William F. McKee told the Air Traffic Control Association recently. He acknowledged that the headlong growth of aviation in the past few years has placed a strain on air traffic control and facilities, but stated that FAA is gearing itself to meet the challenge. Administrator McKee described a new computer at the Cleveland Air Route Traffic Center which can make up to 200,000 calculations a second, and can process 500 flight plans an hour.

AIRCRAFT EVACUATION RULING BENEFITS AIR TRAVELERS

Passengers in transport category airplanes will stand a better chance of escaping with their lives in "survivable" crashes, thanks to a sweeping new safety code now being introduced by the Federal Aviation Administration.

The new set of rules, which involve major modifications in affected aircraft, are the result of a long term study. It was prompted, in part, by FAA's estimate that over past six years, some 270 persons died in survivable passenger plane crashes, primarily of burns and smoke inhalation.

Under the new rules, aircraft manufacturers will have to demonstrate a 90-second emergency evacuation using a full and representative passenger load. Previous FAA rules allowed a two-minute evacuation time. When changes in seating arrangement are made, or when the aircraft is substantially modified, the 90-second evacuation drill will have to be again demonstrated before the plane is approved for service.

By October 24, 1968, transport category aircraft must provide easier access to overwing exits by eliminating interference from seat backs in the immediate area of the exit. In addition, aircraft now in service must have cabin linings with self-extinguishing properties for improved resistance to fire. Airline transports now in service which do not already have interiors with these characteristics must have them installed with the first major cabin overhaul or refurbishing of the passenger cabin.

Planes not type certificated by Oct. 24, 1967, must have fire-retardant materials installed before the crafts leave the factory.

Restraints for stowing carry-on baggage must be installed before April 24, 1969.

Other modifications which must be incorporated before Oct. 1, 1969 are:

- automatic self-supporting, 10-second escape slides from each floor level exit in the cabin higher than six feet above the ground.
- slip resistant and clearly marked escape routes from each overwing exit.
- emergency lighting control switch installed in passenger cabin for operation by flight attendants.
- clear instructions for opening cabin hatches from outside as well as inside.

Other changes required include improved landing gear design, protection of fuel and electrical lines and isolation of fuel and electrical lines.

Static Line Modification Would Aid Novice Parachutists

Use of a "breakaway" tape or cord that would insure safe opening of parachutes on static jumps has been proposed by FAA as a safety measure to protect the lives of sport parachutists.

Novice 'chutists commonly use a static line attached to the aircraft which automatically pulls the parachute's rip cord at a specific distance from the plane, during a jump.

The rip cord pulls the restraining pins, opening the parachute. However, fatal accidents have been traced to improper deployment, or jumper entanglement with the parachute, after the static line had presumably performed its function.

Under the proposal, the additional line would be attached directly to the pilot chute or canopy and would exert a positive pull which would force full deployment. After this happened, the weight of the falling jumper would snap the "breakaway" safety line.

Deadline for comments on the proposed rule (Notice 67-41; Docket 8424) is Dec. 29, 1967. Comments should be submitted in duplicate to FAA, Office of General Counsel, Attn: Rules Docket (GC-24), 800 Independence Ave., S.W., Washington, D.C. 20590.

Stricter VFR Weather Minimums Above 10,000 feet Proposed

Proposed weather minimums for pilots flying at or above 10,000 feet mean sea level (MSL) will require them to have at least five statute miles' visibility, to maintain at least 1,000 feet vertical (over or under) clearance from clouds, and one mile horizontal clearance from clouds.

The FAA proposal is a realistic, 10-year look into the future, when the general aviation fleet is expected to expand from 1,000 to 8,000 turbine aircraft, and the multi-engine piston fleet to 23,000 by 1970.

These weather minimums, already in effect for VFR flight in most airspace between 14,500 and 24,000 feet, will allow pilots more opportunity to "see and avoid." This time-tested rule is the basis for VFR flight.

The proposal, if adopted, would not affect VFR minimums below 10,000 feet which call for a visibility of at least three miles, and require that pilots can remain 1,000 feet above, 500 feet below and 2,000 feet laterally from clouds.

The lowered weather minimums is a companion proposal to the rule proposed last month by FAA (see FAA AVIATION NEWS, November, 1967) to limit the speed of all aircraft flying below 10,000 feet to 250 knots. The intent of the rules is to improve the see and be seen capability of pilots operating in this area.

She Has a Way with Wings

Mrs. Jean Bade Lowrie, King City, Calif., goes all the way when she decides to do something. Flying is no exception. When she made her first solo flight in 1965, she made up her mind not to settle for a mere private pilot license. In little more than 21 months she added a commercial single and multi-engine license, a flight instructor's certificate and an instrument rating. With her in the photo above is her former instructor, now receiving instruction from Mrs. Lowrie.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• The View From Above

On a recent cross-country flight from Staten Island, N.Y., to College Park, Md., I spotted or flew over 21 airports, all of which were unmarked except one. Is there any reason for this anonymity?

It should be absolutely mandatory that any airport registered with the FAA have the name displayed with lettering of uniform size.

As a flight instructor I am concerned about the novice pilot frantically searching for an airport when a little bit of paint, properly applied would be a major step in the direction of safety.

Brooklyn, N.Y.

FAA does not control airports (apart from Washington National and Dulles International), and has no authority to compel airport owners to provide identification from the air.

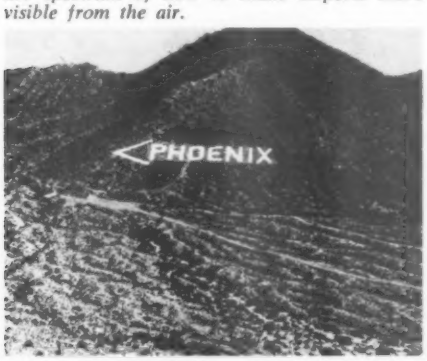
For a number of years the FAA has been actively soliciting assistance from state aviation officials, and other interested parties, in an "Air Marking Program" aimed at identifying airports from the air.

The program concentrates on enlisting voluntary participation by public service organizations such as the Lions, Kiwanis, Chambers of Commerce, etc., working in conjunction with their state aviation commissions, to paint compass bearing and distance to the nearest airport on the roofs of prominent structures.

Eighteen of the 50 states have such programs, the most active being in Pennsylvania where 100 additional air marking signs will soon be added to those already installed. Pennsylvania has 120 more scheduled for 1968. Texas has some 100 air markers, and New Jersey just completed 20 new markers.

Because of fund limitations, the FAA's participation is restricted to technical advice.

Under FAA study now is an "Airport Conspicuity Program" which is examining the entire spectrum of how to make airports more visible from the air.



Largest air marker in the world was built by Air Explorer Scouts on Usery Mtn. On a clear day, the 100-ft. letters of painted stone can be easily seen from 50,000 feet and 35 ground miles away.

• Discovers Treasure

You may count this as a letter from one highly satisfied customer. I recently attended the Flight Instructor's Refresher Clinic at San Mateo College, Calif., and I feel like I discovered a treasury of information.

Like a number of old-time flight instructors who were my "classmates", I was surprised to discover how far behind the times we all were in regard to recent findings in aviation concepts.

Any flight instructor who does not take the opportunity of attending at least one of these clinics is doing himself and his students a gross injustice and should leave the profession.

San Bruno, Calif.

Thanks for the strong endorsement of the FAA's Flight Instructor's Refresher Clinics. As of November 1, a third three-man team was added to the instruction unit which is headquartered at the FAA Aeronautical Center, Oklahoma City, Okla.

The increase in personnel will enable the unit to conduct 75 clinics a year. Since the program's inception in 1962, 6,699 flight instructors have attended refresher programs, and plans are well underway to accommodate 10,000 a year.

FAA does not sponsor the clinics—provisions for attendance, time and place of meeting, etc., must be made by state aviation de the Aircraft Owners and Pilots Association. partments or private organizations such as

FAA supplies instructors, text materials and curriculum. Students are given free of charge, a packet of FAA booklets and pamphlets, including the "Instructor's Handbook," "Instrument Flight Training Handbook," all seven pilot examination guides, to mention a few of the 26 publications in the study kit.

Persons interested in setting up a flight instructors clinic should get in touch—either directly or by letter—with their local FAA general aviation district office. Not all requests can be fulfilled but each will be evaluated on its merits.

• Mixing VFR and IFR Traffic

The FAA Instrument Flying Handbook says the IFR pilot needn't worry about temperature and pressure affecting his altimeter since all other IFR aircraft in the vicinity are experiencing the same effects simultaneously. But how about the mix of IFR flying indicated and VFR flying MSL altitudes? Couldn't this result in two aircraft at the same actual altitude?

Miami, Fla.

Remote as it is, the possibility does exist for two aircraft to be at the same altitude if one is using an MSL calculation and the other an indicated altitude. However, FAR Part 91.81 specifies the use of MSL only at 18,000 feet or above.

In any event, whenever there is a mix of IFR and VFR traffic, the importance of "see and be seen" alertness must not be forgotten.

• Fatalities vs. Fatal Accidents

The 1962 fatality rate (per 100,000 hours) of 6.7 shown on the graph accompanying "The Prevailing Cause" in the September 1967 *Aviation News* does not agree with the much lower figure of 3.1 given in CAB's "General Aviation Accidents, A Statistical Review, 1962." Which is correct?

Pennsylvania

Both are correct. The CAB's figure refers to fatal accidents *per 100,000 hours, whereas the figure used in our article referred to persons killed. A fatal accident might involve one or more deaths.*

• The Pilot Field

I am interested in learning something about future prospects for the commercial pilot. Can you answer the following questions: (1) What are the projected airline pilot needs for 1968, 1969, and 1970? (2) What is the airline pilot retirement age? (3) How many persons in the U.S. now hold commercial and instrument ratings? (4) How many military pilots enter commercial aviation each year?

Minnesota

(1) The major air carriers expect to hire 2,242 flight officers in 1968, 1,261 in 1969 and 1,029 in 1970. Over the same period the local air carriers expect to hire 157, 158 and 184.

(2) FAA requires air carrier pilots to retire at age 60. (3) As of January 1, 1966, FAA had on record 116,665 holders of commercial licenses and 93,637 instrument-rated pilots. (4) Information on numbers of military pilots entering commercial service annually would have to be obtained directly from the air carriers. The number of pilots being trained by the military services is rising sharply, and the number of such pilots who become available to the air carriers would be affected by the course of the war in Viet-Nam.

• Man of Few Words

What is a "Blue Seal" private pilot rating?

Florida

Persons who have demonstrated that they can control their plane in flight by reference to instruments are entitled to have a blue seal affixed to their private pilot certificate. These certificates convey no additional privileges, but are intended to encourage pilots who may not have an opportunity to obtain an instrument rating to gain some instrument proficiency.

Correction on G.I. Bill

Education assistance to veterans enrolled in flight training courses under the Veteran's Pension and Readjustment Assistance Act of 1967 must be approved by the Veterans Administration—not by the FAA Administrator, as previously reported.

FAA approval, as well as approval by the appropriate State aviation authority, is needed for the flying school at which the instruction is to be taken. The applicant must also qualify for an FAA Class II medical certificate, and have a private pilot's license or at least the required flying hours.

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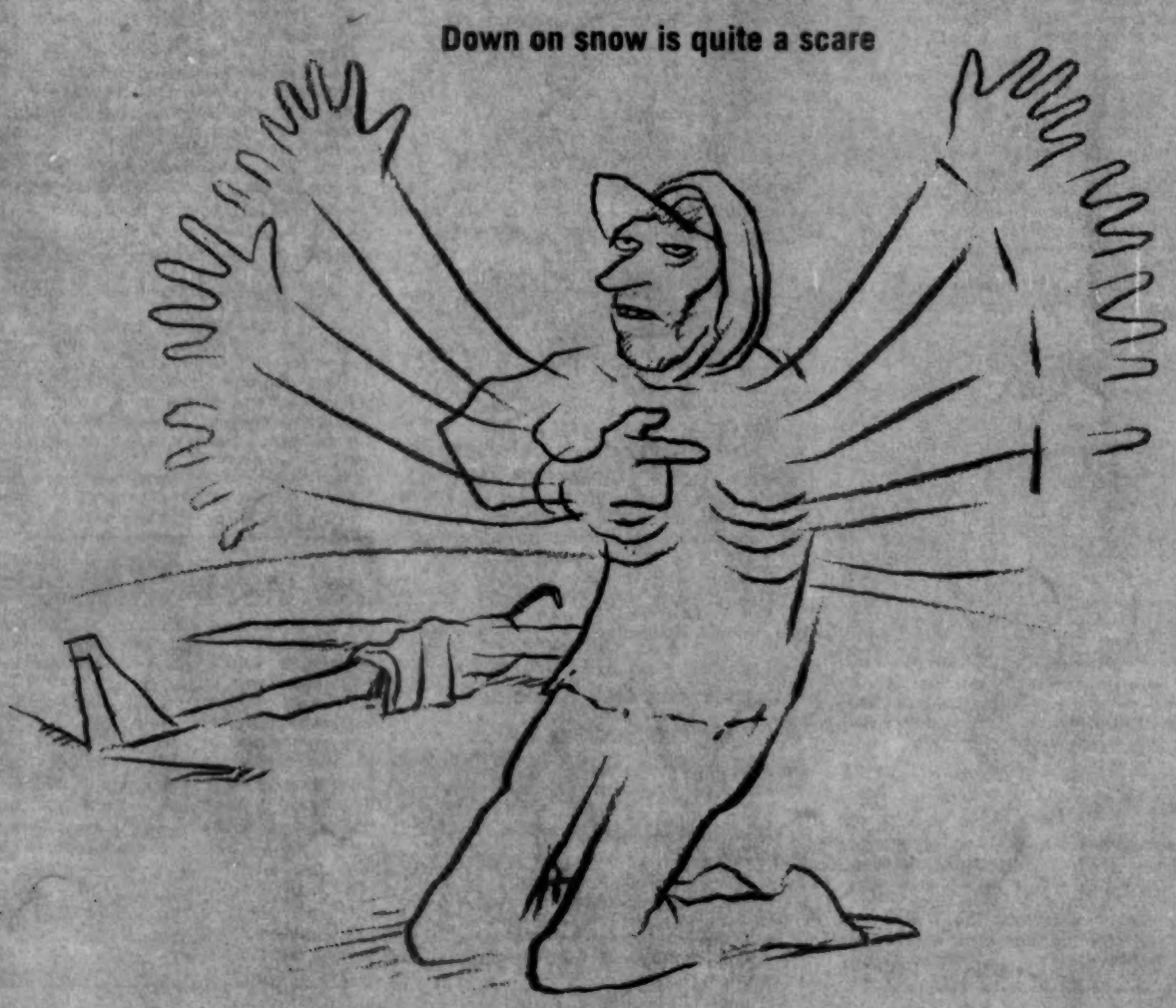
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